

Managing Multidrug-Resistant Organisms (MDROs) in Long-term Care Facilities: Practical Tips for Preventing Transmission

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December 15, 2011

Presentation Outline

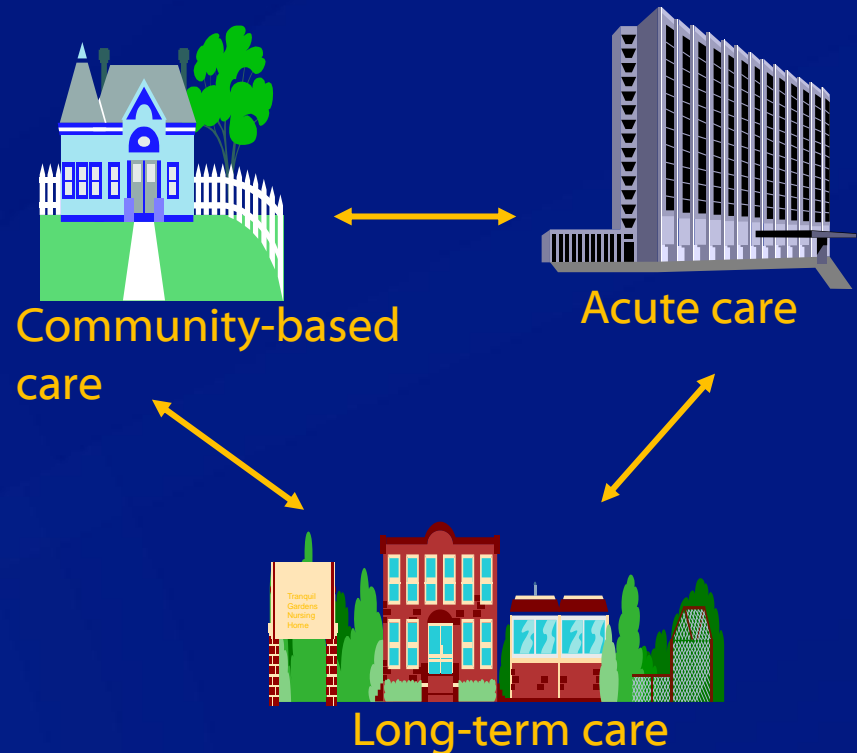
- ❑ Describe the growing problem of multidrug-resistant organisms (MDROs) in long-term care facilities (LTCF)
- ❑ Understand the basics about multidrug-resistant organisms (MDROs) and how they emerge and spread in healthcare facilities
- ❑ Understand the strategies to address the emergence/spread of multidrug-resistant organisms (MDROs) in LTC.
- ❑ Provide examples of applying these prevention strategies to address specific HAI's such as C.difficile and Carbapenem-resistant Enterobacteriaceae (CRE)

Changing population in nursing homes

- 3.2 million residents received care in 15,956 certified NH/SNF in the US in 2008
 - Acute care hospitals are the primary source of new admissions
- From 1999 to 2008
 - 16% decrease in the number of nursing home beds/ 1000 residents of US population;
 - 10% increase in the number of residents cared for in LTC
 - Increasing proportion of individuals under the age of 65 are receiving care in LTCFs (13.6% in 2008)
 - Growing post-acute care population as custodial care shifts to assisted-living

Growing complexity in the nursing home resident population

- ❑ Increasing post-acute care population
 - Growing medical complexity and care needs
 - Increasing exposure to devices, wounds and antibiotics
- ❑ Dynamic movement across healthcare settings
- ❑ High prevalence of multidrug-resistant organisms



INFECTION CONTROL AND HOSPITAL EPIDEMIOLOGY FEBRUARY 2008, VOL. 29, NO. 2

ORIGINAL ARTICLE

Importance of Bacterial Burden Among Methicillin-Resistant
Staphylococcus aureus Carriers in a Long-Term Care Facility

INFECTION CONTROL AND HOSPITAL EPIDEMIOLOGY JUNE 2009, VOL. 30, NO. 6

ORIGINAL ARTICLE

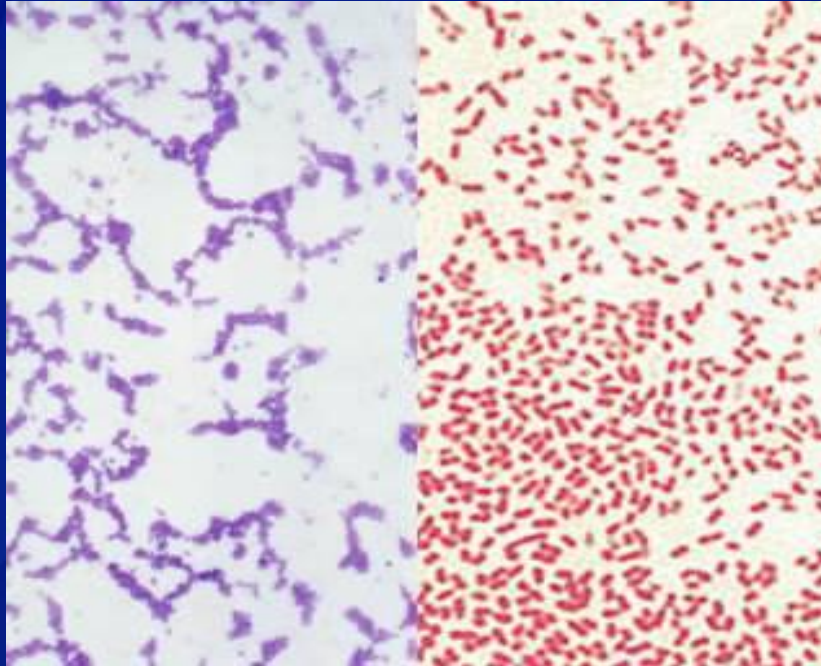
Clostridium difficile Infection in Ohio Hospitals
and Nursing Homes During 2006

Clinical Infectious Diseases 2010;50(12):1617–1618

The Pivotal Role of Long-Term Care Facilities
in the Epidemiology of *Acinetobacter baumannii*:

Basics on bacteria

Gram Stain
Positive
(purple)



Gram Stain
Negative
(pink/red)

- Bacteria have different characteristics that allow us to identify them in the lab
 - Growth patterns, structure of the cell
- We use these characteristics to develop antibiotics

Common types of bacteria

Gram positive

- ❑ Most are cocci, "round bacteria"
 - ❑ Streptococcus, Staphylococcus, Enterococcus
- ❑ Clostridium difficile (C. diff) is a Gram positive rod



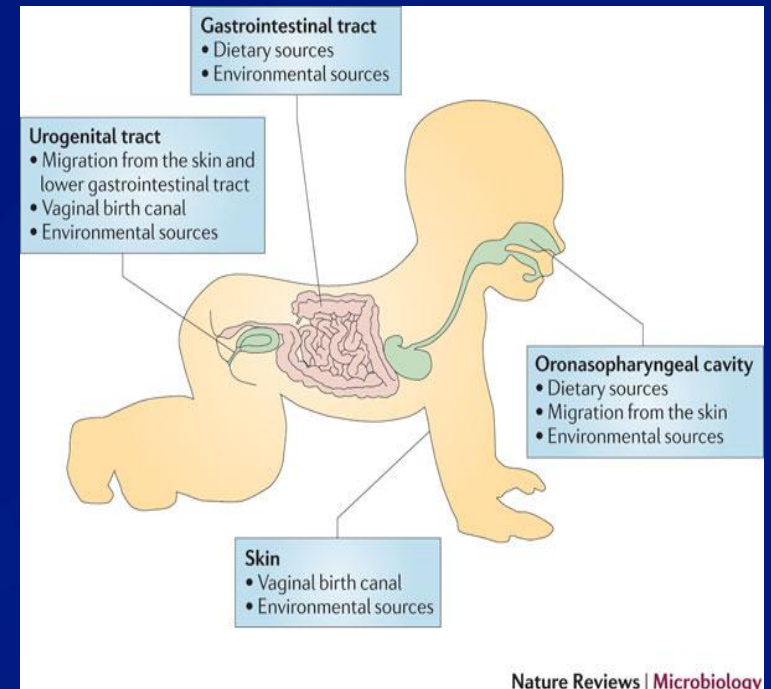
Gram negative

- ❑ Most are bacilli, "rod-shaped bacteria"
 - ❑ Enterobacteriaceae: E coli, Klebsiella, Enterobacter, Proteus
 - ❑ Pseudomonas



Normal bacterial carriage

- People have bacteria living in and on us all the time
- Some live on our skin, some in our nose and throats, others in our bowels
- Our bodies need these bacteria to help us
 - Some digest food/nutrients, others block bad bugs
- These “colonizing” bacteria aren’t harmful
- Only bacteria that invade our system and cause illness need to be treated



Antibiotics 101

- ❑ Antibiotics are drugs that treat and kill bacteria
- ❑ They are grouped into classes based on their structure and activity
 - Narrow-spectrum target a few specific bacteria
 - Broad-spectrum can kill a wide variety of bacteria
- ❑ Infection prevention programs track certain “bug-drug” combinations for evidence that the bacteria is getting resistant
 - Bacteria with resistance can cause patients to have more severe, costly infections which are harder to treat

Antibiotic Classes

Penicillins

- ❑ Examples: Penicillin, amoxicillin, ampicillin, methicillin
- ❑ Penicillins can be combined with a drug to help them overcome certain bacterial resistance
 - Amoxicillin + Clavulante = Augmentin;
 - Piperacillin + tazobactam = Zosyn

Cephalosporins (cousins to penicillins)

- ❑ 1st generation (more gram positive activity):
Cephalexin, Cefazolin
- ❑ 3rd/4th generation (more gram negative): Ceftriaxone, Ceftazidime

Antibiotic Classes (cont)

Carbapenems

- ❑ Examples: Imipenem, meropenem, ertapenem
- ❑ Extremely broad-spectrum, among the most powerful antibiotics we currently

Miscellaneous drugs with only gram positive activity: Vancomycin, linezolid, daptomycin

- ❑ Vancomycin is the primary treatment for Methicillin-resistant *Staphylococcus aureus* (MRSA)
 - Oral vancomycin is ONLY used to treat C difficile;
 - IV Vancomycin must be used to treat all other infections
- ❑ Enterococci that develop resistance to Vancomycin are called Vancomycin-resistant enterococci (VRE)

Antibiotic Classes (cont)

Fluoroquinolones

- ❑ 1st generation (Ciprofloxacin) mostly gram neg activity, often used for UTI treatment
- ❑ 2nd/3rd gen (Levofloxacin/Moxifloxacin) have broader activity, can cover Streptococcus pneumoniae and other respiratory/sinus bacteria

Aminoglycosides

- ❑ Examples: Gentamicin, Tobramycin, Amikacin
- ❑ Excellent gram negative drugs – especially for urinary tract
- ❑ Aren't used as much because can be toxic to the kidneys, need to be monitored when used

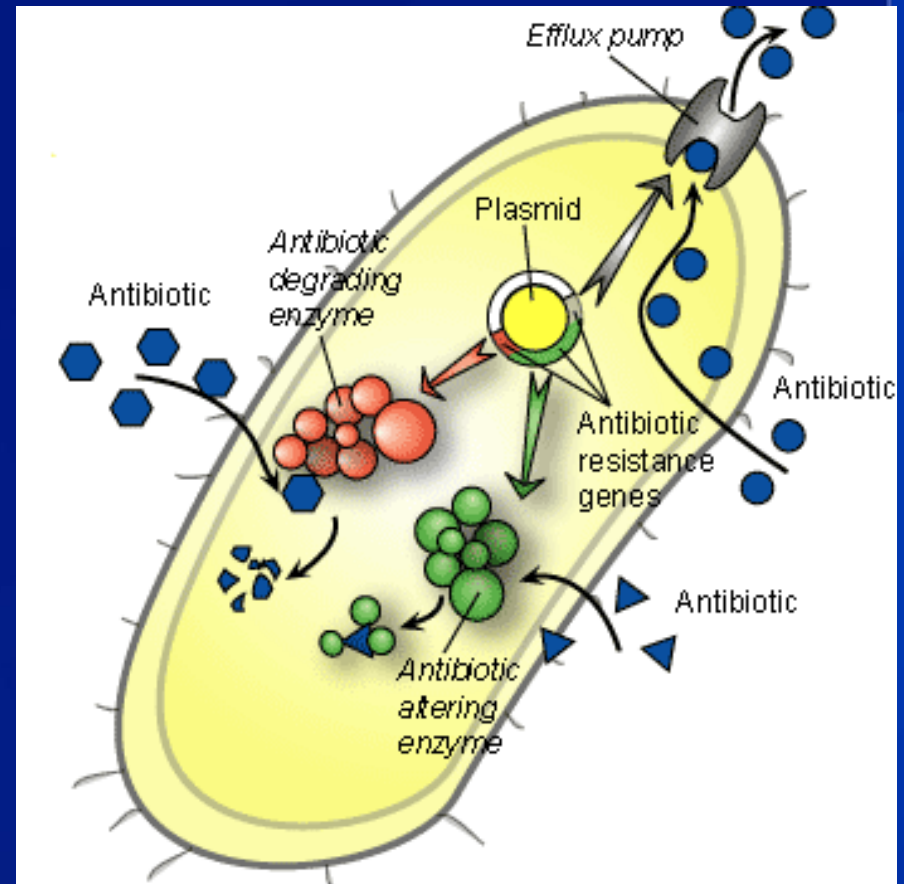
Antibiotic Classes (cont)

Miscellaneous drugs

- ❑ Trimethoprim/Sulfamethoxazole (Bactrim): Considered by many to be narrow spectrum, but has Gram neg and Gram pos activity, used to treat UTIs, also good for MRSA skin infections
- ❑ Azithromycin ("Z-pack"): Also considered more narrow spectrum, good for respiratory/sinus infections
- ❑ Metronidazole (Flagyl): One of the main treatments for C. difficile infections

Mechanisms of antibiotic resistance

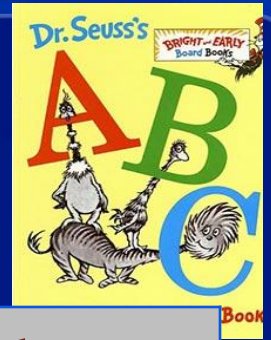
- ❑ Production of proteins that destroy antibiotics
 - ❑ Beta-lactamases
 - ❑ Carbapenemases
- ❑ Change their cell structure so antibiotics can't bind and block their function
- ❑ Reduce their antibiotic exposure
 - ❑ Pump drugs out
 - ❑ Increase cell barriers to keep drug out



Defining Multidrug-resistance

- ❑ Resistant to treatment by several antibiotics from unrelated classes
- ❑ Sometimes just one key drug resistance will define an important MDRO, for example, Methicillin-resistance in *Staph aureus*
- ❑ Sometimes bacteria acquire resistance to several classes, often seen in gram negative rods
 - ❑ Cephalosporin-resistance is a big concern in bacteria like *E coli*/*Klebsiella* which often cause UTIs
 - ❑ *Pseudomonas* will be resistant to fluoroquinolones, penicillins, cephalosporins, and carbapenems

ABC's of MDROs



Bacteria	Abbrev.	Antibiotic Resistance
Staphylococcus aureus	MRSA	Methicillin-resistant
Enterococcus (faecalis/faecium)	VRE	Vancomycin-resistant
Enterobacteriaceae (E coli/Klebsiella, etc)	CRE (KPC)	Carbapenem-resistant
Pseudomonas/ Acinetobacter	MDR	Many drug classes

Case of an emerging MDRO....

Clinical Infectious Diseases 2010;50(12):1611–1616

MAJOR ARTICLE

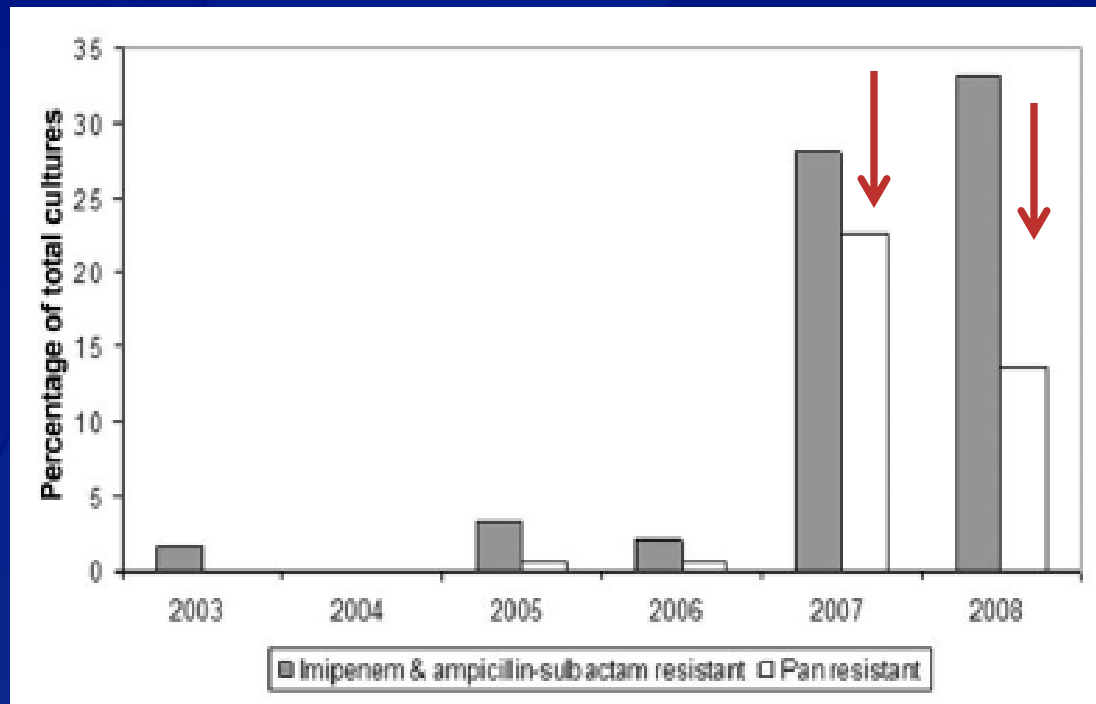
Multidrug-Resistant *Acinetobacter baumannii*: An Emerging Pathogen among Older Adults in Community Hospitals and Nursing Homes

D. M. Sengstock,^{1,2} R. Thyagarajan,^{1,2} J. Apalara,¹ A. Mira,¹ T. Chopra,² and K. S. Kaye²

¹Internal Medicine/Geriatrics, Oakwood Hospital, Dearborn, and ²Department of Internal Medicine, Wayne State University, Detroit, Michigan

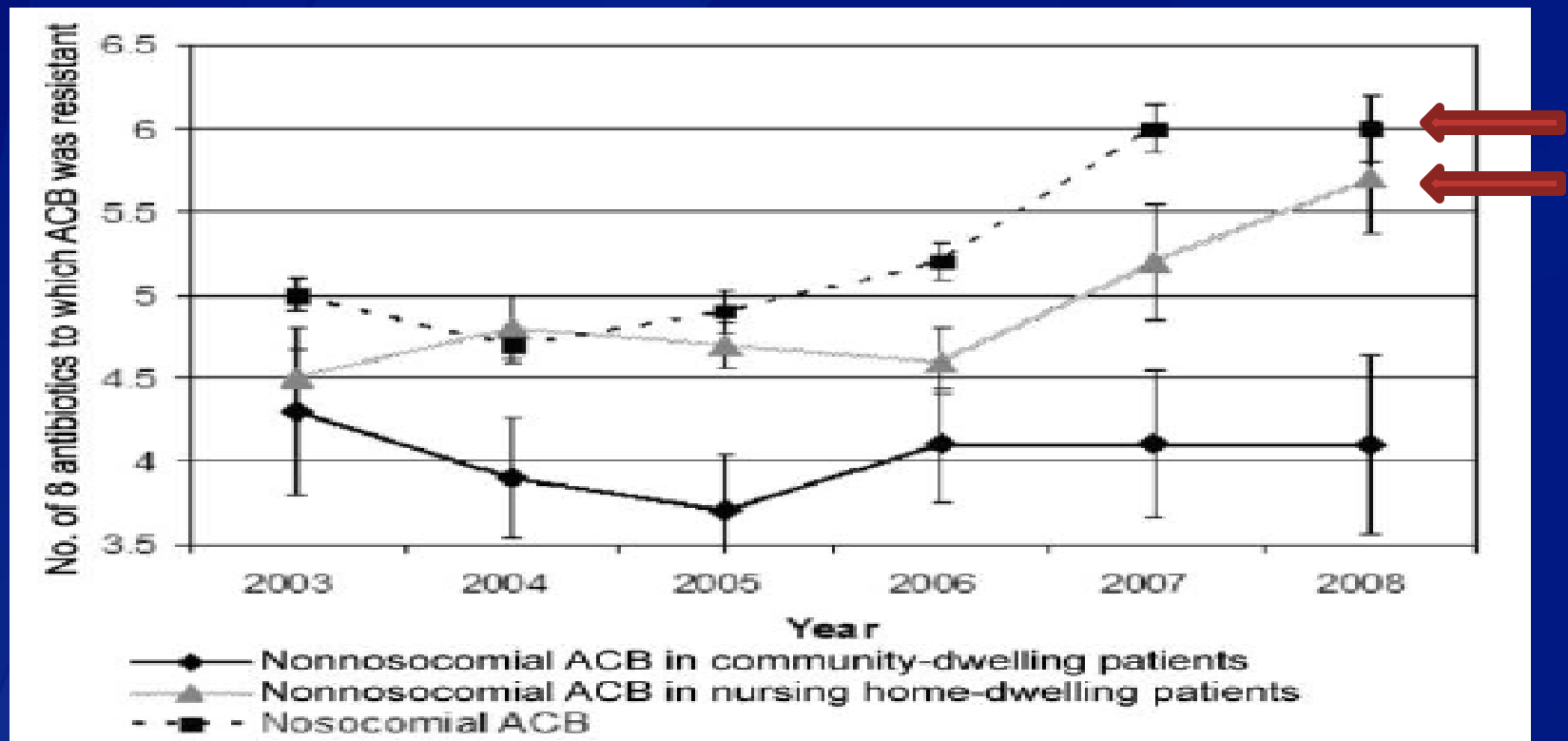
- ❑ Lab examined all the *Acinetobacter* cultured from people at 4 local hospitals over 5 years
- ❑ Classified as hospital-associated, NH-associated, or community-associated
- ❑ Wanted to see how antibiotic resistance emerged in this community

Multidrug-resistance emerged quickly



- ❑ Over 5 year period, antibiotic resistance increased dramatically
 - ❑ In the last 2 years of the study pan-resistant bacteria emerged
- ❑ Culture sources: Respiratory secretions (56%); Wounds (22%); Urine (12%)

Healthcare facilities are the source of MDROs



- ❑ All the highly resistant bacteria were coming from patients in the hospital or those in the nursing homes – NOT from people living at home

Critical message about care transitions

The increase in prevalence of *Acinetobacter* strains in nursing homes and the degree of antibiotic resistance among these strains is extremely concerning. As the current study demonstrates, the degree of antibiotic resistance among “hospital-acquired” *Acinetobacter* cultures increased during the study period in parallel with the degree of resistance among *Acinetobacter* isolates from nursing home-dwelling patients. The epidemiology of *Acinetobacter* infection among older adults in this study indicates the existence of a hospital–nursing home “coupling.” This coupling supports a continuous circuit that nurtures the dissemination of multidrug-resistant *Acinetobacter* strains among both types of health care facility. Consequently, coordinated regional efforts are needed to control the spread of this pathogen. Long-term care facilities, despite their vulnerable populations, generally have few resources for infection surveillance and prevention.

MDROs in the healthcare setting

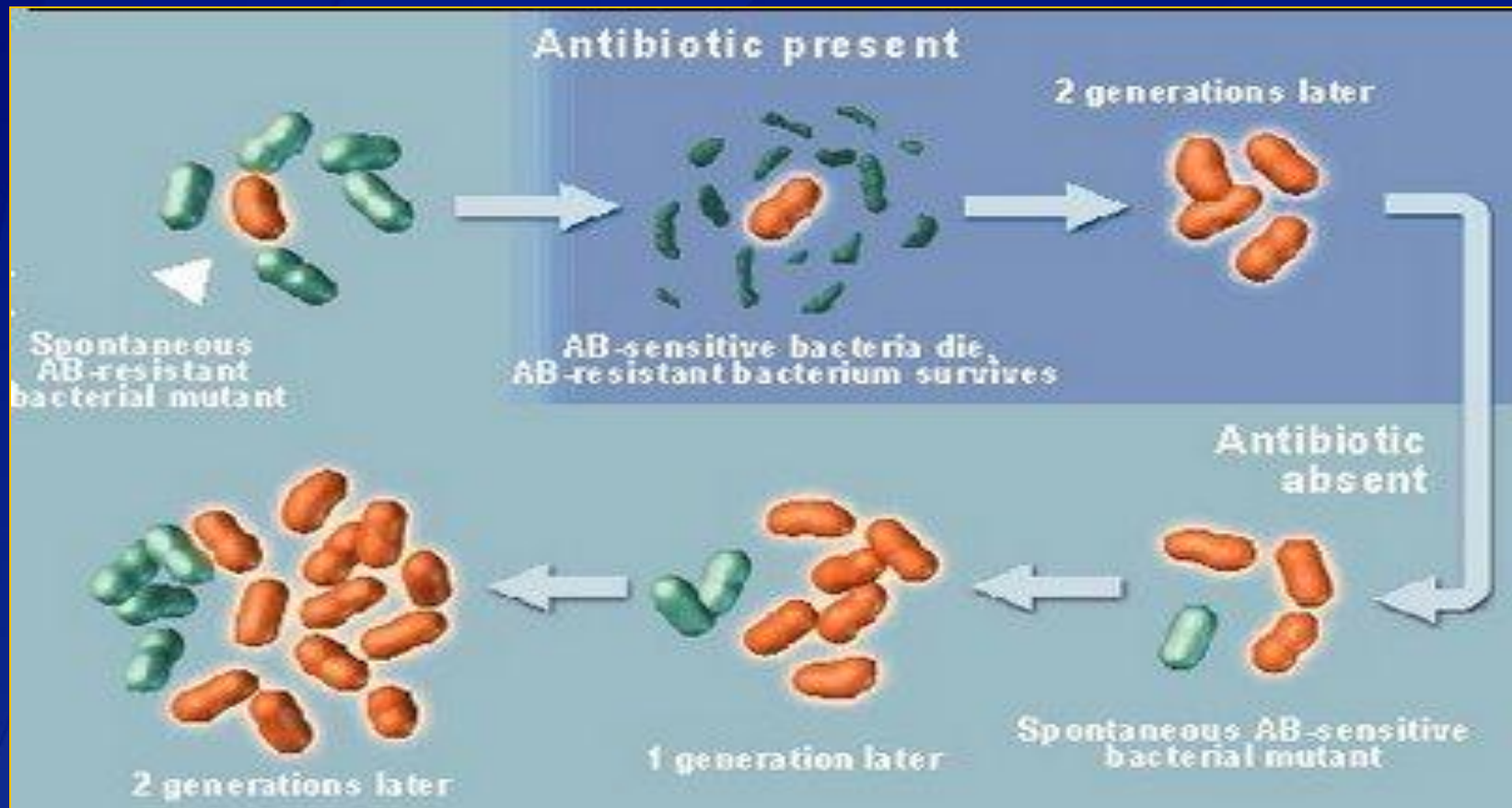
DEVELOPMENT

- ❑ Antibiotic pressure
 - ❑ Most common predictor of antibiotic resistance is prior exposure
- ❑ Device utilization
 - ❑ Biofilm formation on central lines, urinary catheters, etc.

SPREAD

- ❑ Patient to patient transmission via healthcare workers
- ❑ Environmental / equipment contamination
- ❑ Role of colonization pressure on acquisition

Resistance from antibiotic pressure



- ❑ At first most of the bacteria can be killed by the drug (green)
- ❑ But, once they are wiped out, the resistant bugs take over (red)

Antibiotic use drives resistance

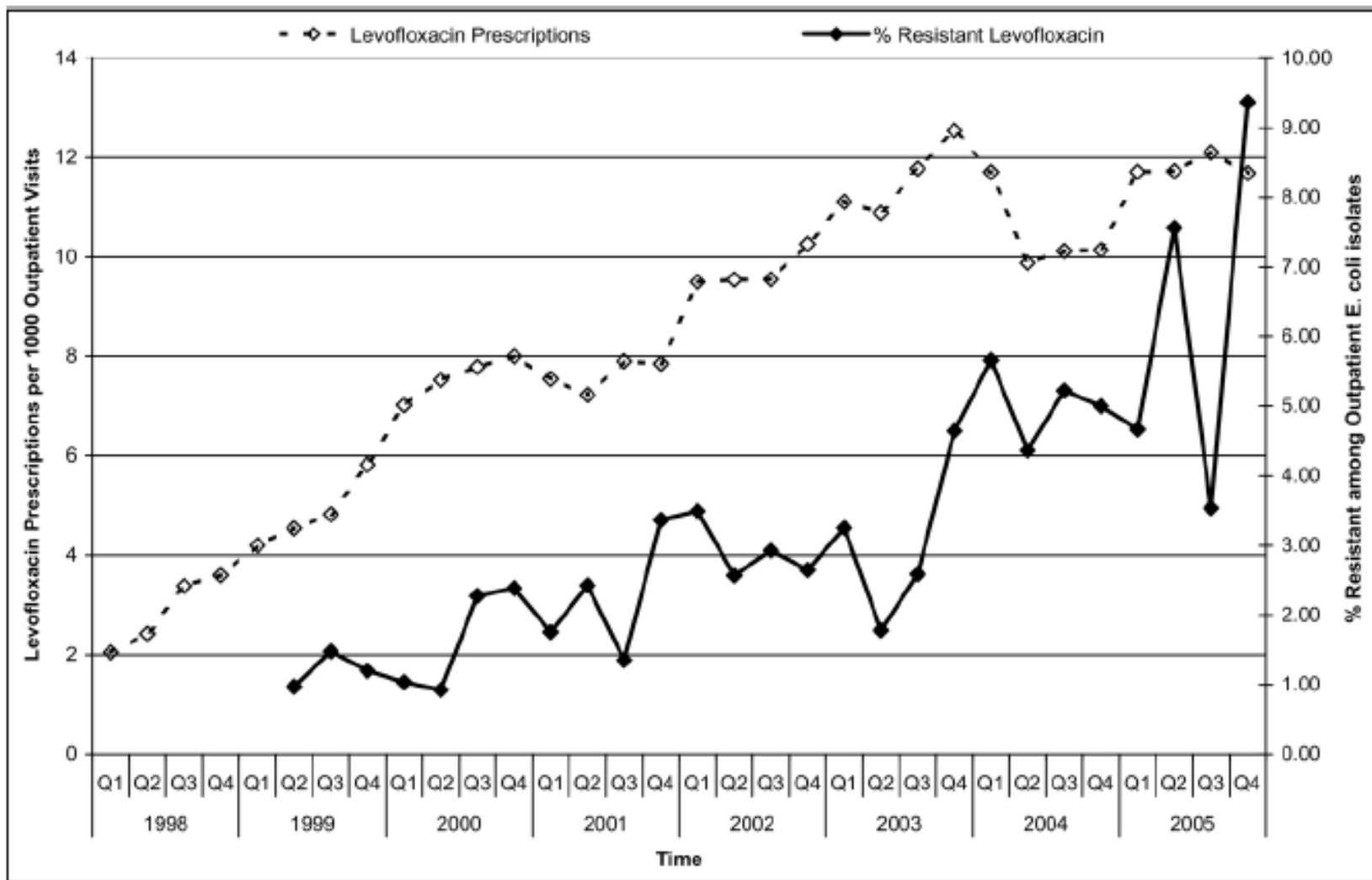
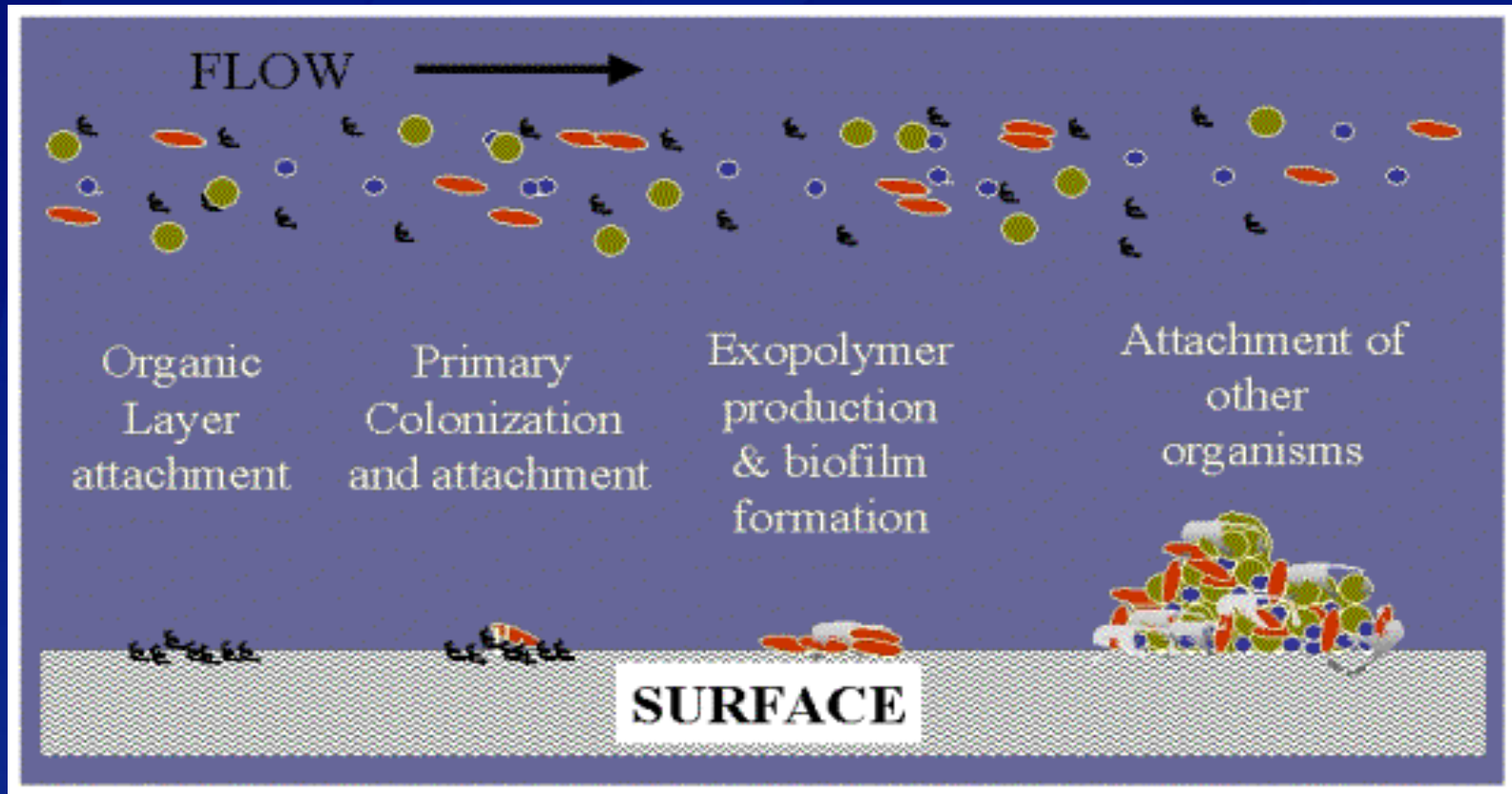


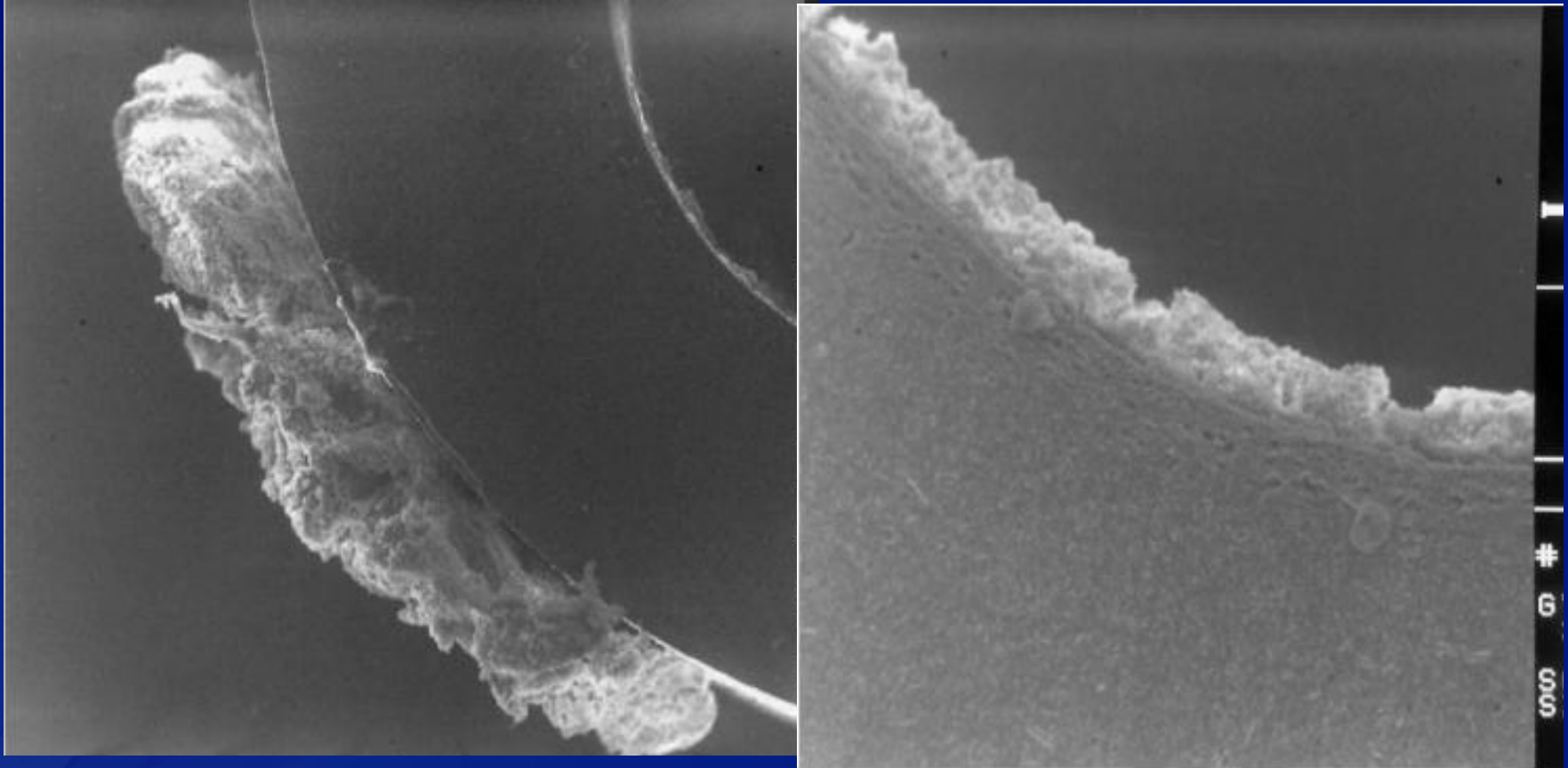
Figure 1 Levofloxacin use and outpatient *Escherichia coli* resistance to levofloxacin versus time.

Biofilm formation on device surfaces



- ❑ Biofilm: An collection of bacteria within a sticky film that forms a community on the surface of a device

Biofilm on an indwelling catheter



Resistance develops within biofilms

- ❑ Bacteria within a biofilm are grow every differently from those floating around freely
 - ❑ These changes in their growth make our antibiotics less effective
- ❑ Antibiotics can't penetrate the biofilm to get to the bacteria
 - ❑ This leads to much less drug available to treat the bugs
- ❑ Bacteria within the biofilm can talk to each other and share the traits that allow some to be resistant
 - ❑ Over time more and more of them become resistant as well



Patient Safety

HHS/ASCR/OPHS/OS/ASCR

CLEAN HANDS SAVE LIVES

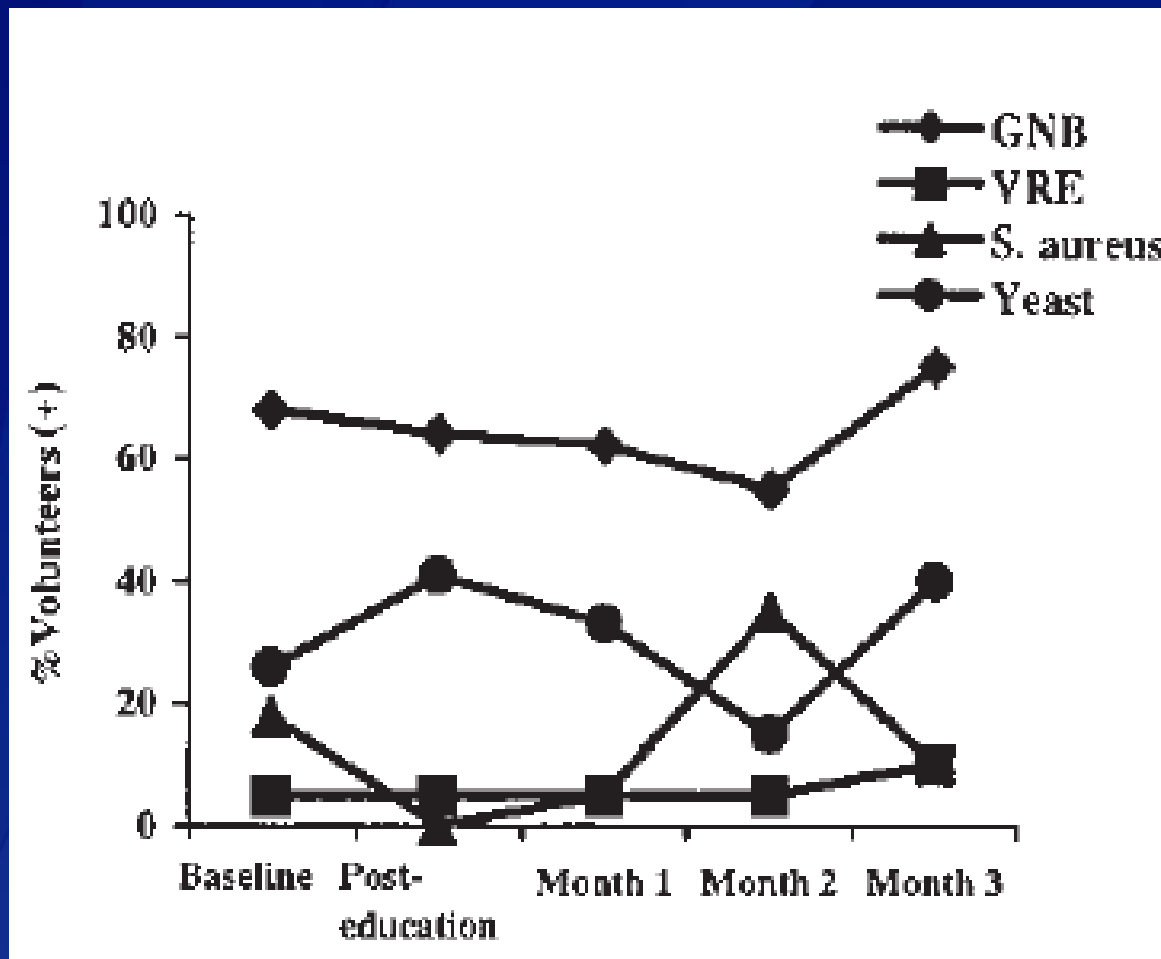
Protect patients, protect yourself



Alcohol-rub or wash
before and after *EVERY* contact.



Bacterial contamination of HCW hands prior to hand hygiene in a LTCF



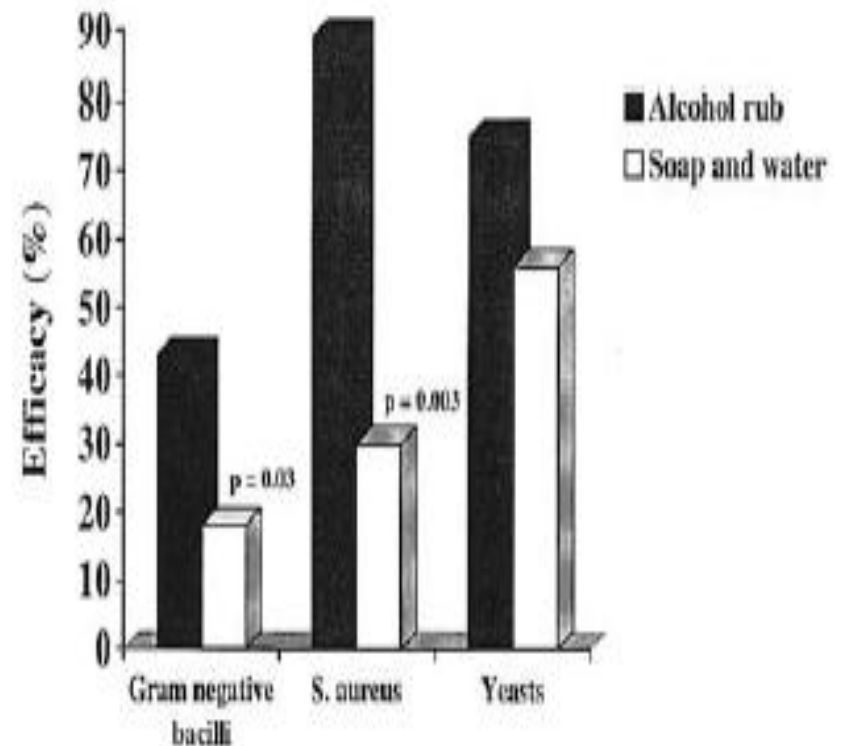
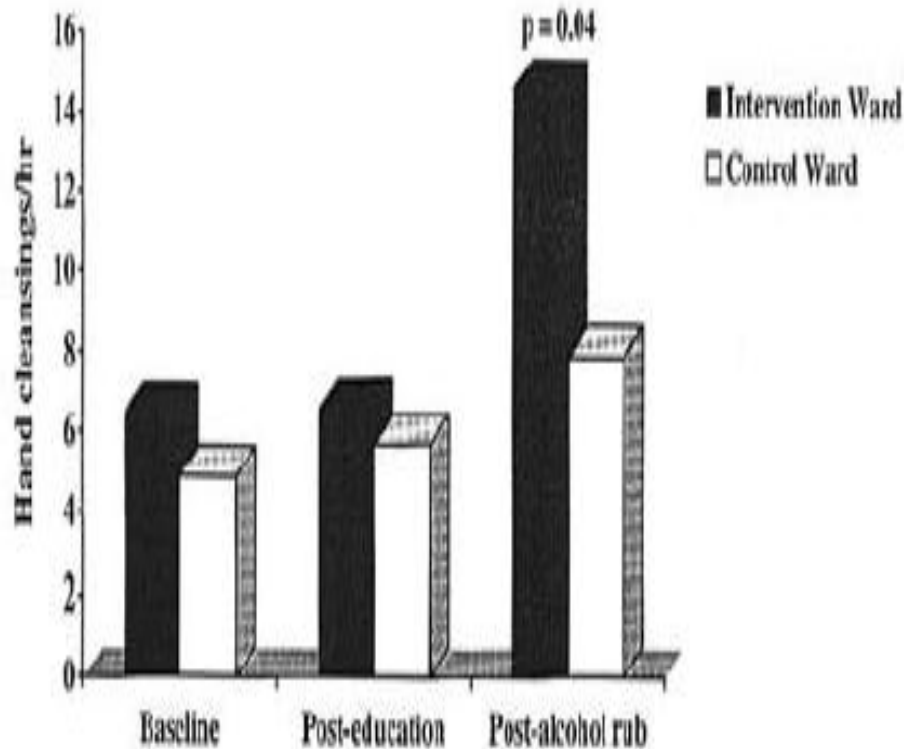
- Gram negative bacteria were the most common bugs cultured from hands of staff
- Most Gram neg. bacteria live in the bowls or colonize the urine!!!

Hand Hygiene

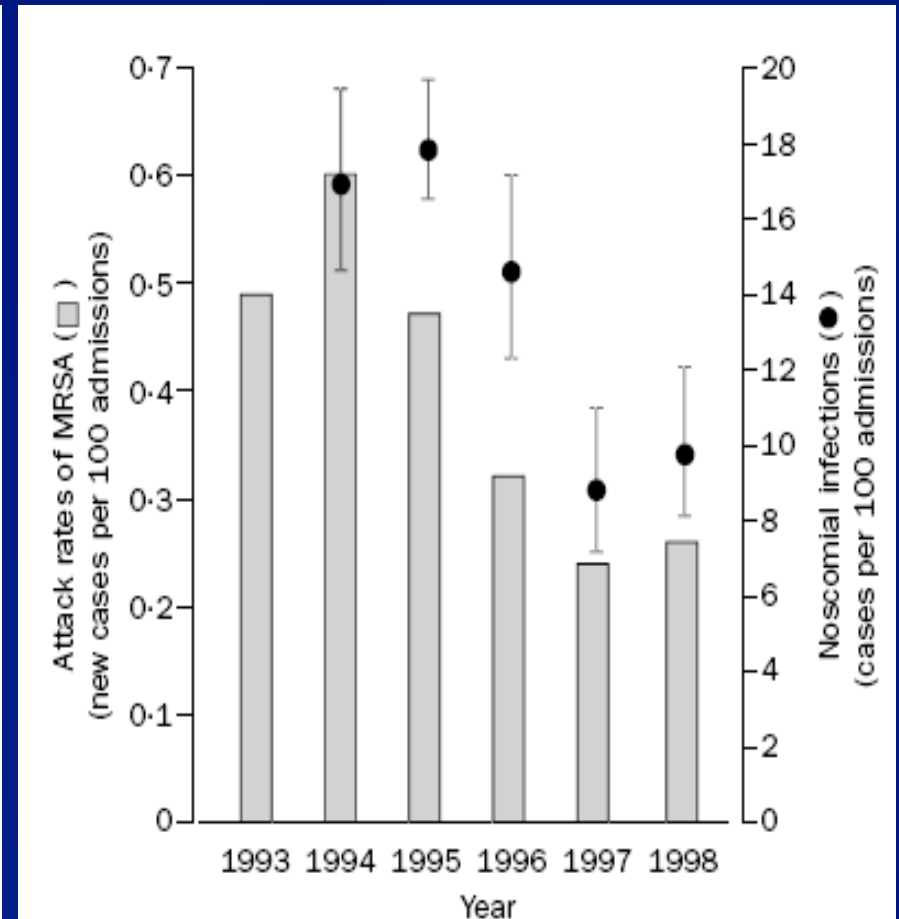
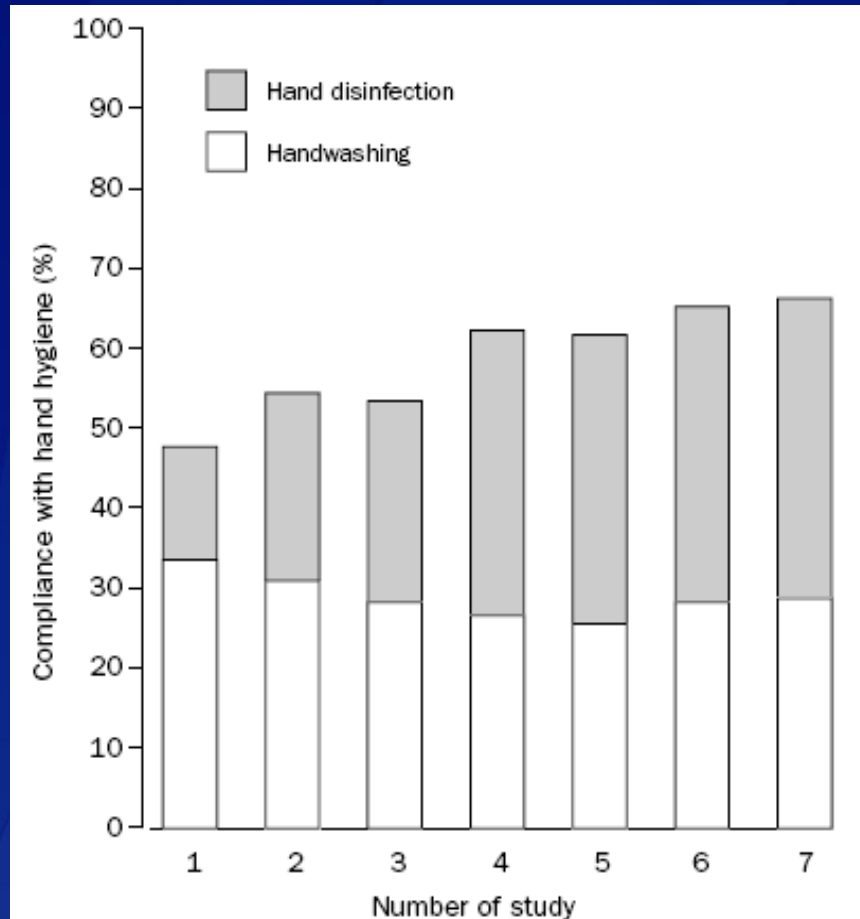
- ❑ Most effective and least costly means of preventing the transmission of MDROs
- ❑ Yet, compliance still ranges between ~30-60%



Alcohol-based hand rub improves compliance and decontamination



Decreased MRSA infections associated with increased hand hygiene compliance





REVIEW

The role of environmental cleaning in the control of hospital-acquired infection

S.J. Dancer*



The invisible reservoir of MDROs



X marks the locations where VRE was isolated in this room

- Image from Abstract: The Risk of Hand and Glove Contamination after Contact with a VRE (+) Patient Environment. Hayden M, ICAAC, 2001, Chicago, IL.

Slide courtesy of Teresa Fox, GA Div PH

Duration of environmental contamination by MDROs

Pathogen	Survival	Data Strength	Transmission Settings
<i>C difficile</i>	Months	3+	Healthcare facilities
MRSA	Days-weeks	3+	Burn units
VRE	Days-weeks	3+	Healthcare – higher risk areas
<i>Acinetobacter</i>	33 days	2/3+	Wet or dry environments
<i>Pseudomonas aeruginosa</i>	7 hours	1+	Wet environments

Adapted from Hota. *Clin Infect Dis*. 2004;39:1182-1189.

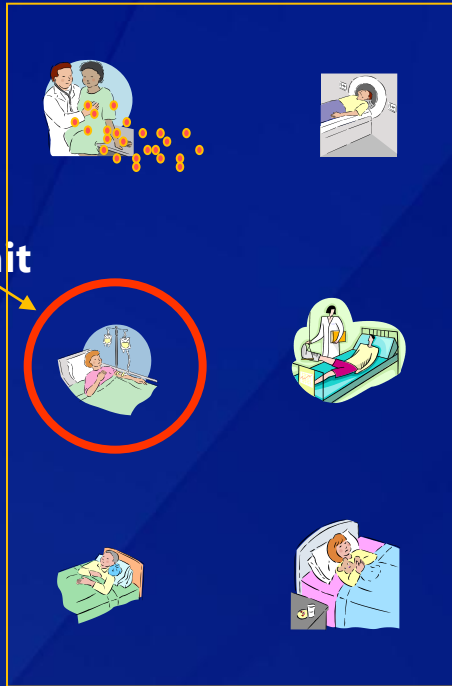
Colonization pressure on risk of acquisition

- ❑ Colonization pressure: Presence of other MDRO carriers on a unit will increase the risk of MDRO acquisition to a non-carrier close by
- ❑ Studies have demonstrated the impact of colonization pressure on acquisition of MRSA, VRE and CDI
- ❑ Both asymptomatic carriers (colonized) and actively infected individuals can be a source for transmission (spread) on a unit

Williams VR et al. Am J Infect Control. 2009 Mar;37(2):106-10
Bonten MJ et al. Arch Intern Med. 1998 May 25;158(10):1127-32.
Dubberke ER et al. Arch Intern Med. 2007 May 28;167(10):1092-7

Colonization pressure: CDI example

CDI pressure
= 1 × days in unit



Unit A

Fewer patients with active CDI
= lower risk of acquiring CDI

CDI pressure
= 5 × days in unit



Unit B

More patients with active CDI
= higher risk of acquiring CDI

Key MDRO prevention strategies

- ❑ Assessing hand hygiene practices
- ❑ Rapidly reporting MDRO lab results
- ❑ Implementing Contact Precautions
- ❑ Recognizing previously colonized patients
- ❑ Strategically place residents based on MDRO risk factors
- ❑ Careful device utilization
- ❑ Antibiotic stewardship
- ❑ Inter-facility communication

Assessing Hand Hygiene

- Hand hygiene should be a cornerstone of prevention efforts
- As part of a hand hygiene intervention, consider:
 - Ensuring easy access to soap and water/alcohol-based hand gels
 - Observation of practices - particularly around high-risk situations (before and after contact with colonized or infected patients)
 - Feedback – “Just in time” feedback if failure to perform hand hygiene observed

Prompt recognition of MDROs in laboratory reports

- Facilities should have a mechanism for rapidly communicating positive MDRO lab results to clinical area
 - Allows for rapid initiation of interventions on newly identified MDRO carriers
- Consider implementing precautions while waiting for results from the lab if an MDRO is possible
 - For example, contact precautions for a resident with diarrhea while waiting for results of a C diff stool study

To Isolate or Not to Isolate?

- An 81yo is transferred back to your SNF for rehab following an elective total hip replacement
 - *A pre-op nasal swab "newly" identified her as a carrier of MRSA*
 - *At the time of transfer, she has an indwelling urinary catheter (usually voids without a catheter)*
- Would you place her on contact isolation precautions?
- Yes, No, Need more information...

CDC thoughts about MDRO management in LTC...

V.A.5.c.ii.1 “For relatively healthy residents (e.g., mainly independent) follow Standard Precautions making sure that gloves and gowns are used for contact with uncontrolled secretions, pressure ulcers, draining wound, stool incontinence, and ostomy tubes/bags.”

V.A.5.c.ii.2. For ill residents (e.g., those totally dependent upon healthcare personnel for healthcare and activities of daily living...) and for those residents whose infected secretions or drainage cannot be contained, use Contact Precautions, in addition to Standard Precautions.”

V.A.5.c.iii. For MDRO colonized or infected patients without draining wounds, diarrhea, or uncontrolled secretions, establish ranges of permitted ambulation, socialization, and use of common areas based on their risk to other patients and on the ability of the colonized or infected patients to observe proper hand hygiene and other recommended precautions to contain secretions and excretions.

What are the 8 key elements of Standard Precautions ?

1. Hand hygiene
2. Personal Protective Equipment (PPE)
3. Respiratory Hygiene/Cough Etiquette
4. Safe injection practices
5. Environmental controls
6. Safe laundry practices
7. Resident placement (private/cohort)
8. Waste management

Standard Precautions: When should hand hygiene be performed?

- Before and after physical contact with a resident
- Before donning gloves and after removing gloves
- After handling soiled or contaminated items and equipment, including linens
- Before performing an invasive procedures
- Before handling sterile or clean supplies
- When hands are visibly dirty or soiled with blood and/or bodily fluids*
- After care of a resident with known or suspected infectious diarrhea*
- Before and after eating or handling food*
- After personal use of bathroom*

***Situations where soap and water preferred over alcohol-based hand rub**

Standard Precautions: When should PPE be used?

Gloves:

- Before any possible contact with blood or body fluids, mucous membranes (eyes, nose, mouth) or potentially infectious materials such as contaminated medical equipment or waste

Face masks or shields

- To protect eyes during situations where blood or body fluids may spray or splatter

Gowns

- To protect skin and clothing during situations where blood or body fluids may spray or splatter or care of resident could result in contamination of skin/clothing

Contact Precautions

- (Hand Hygiene)
 - Before/after PPE use
 - During resident care as appropriate (e.g. if gloves changed)
- Use of gown and gloves for direct resident care
 - Don prior to room entry
 - Remove prior to room exit
- Dedicating non-essential items for resident care
 - May help decrease transmission due to contamination
 - Blood pressure cuffs; Stethoscopes; IV poles and pumps
- Private rooms or cohorting residents if possible

Challenges with Contact Precautions

- Lack of private rooms / limited ability to move residents
 - Moving people is disrupting to residents and staff
 - Ability to identify carriers to cohort is limited (no active surveillance in most facilities)
- Determining duration of contact precautions
 - Unable to restrict resident mobility and participation in social events/therapy for prolonged periods
 - Unlikely to document clearance of carriage
- Large population of residents with unrecognized MDRO carriage
 - Underestimating the sources of potential transmission

Recognizing prior colonization

- ❑ Individuals can be colonized with MDROs for months
- ❑ Being able to identify previously colonized or infected individuals allows for application of appropriate interventions in a timely fashion
- ❑ Being an MDRO carrier should not prevent a resident from being admitted to a LTCF,
 - ❑ Knowledge allows us to plan for them to have the safest care
 - ❑ For every resident carrying an MDRO that we know about, there are probably 3 others we don't know

Strategic placement of residents based on risk factors

- New roommate assignments on resident characteristics and history of MDRO carriage
 - Try to avoid placing two high risk residents together
 - May be safer to cohort low-risk and high-risk residents
- Don't necessarily change stable room assignments just because of a new culture result unless it now poses new risk
 - Roommates who've been together for a long time have already had opportunity to share organisms in the past (even if you only learned about it recently)

Resident characteristics to consider:

“The 5 C’s”

- Cognitive function (understands directions)
- Cooperative (willing and able to follow directions)
- Continent (of urine or stool)
- Contained (secretions, excretions or wounds)
- Cleanliness (capacity for personal hygiene)

Consider contact precautions during direct care

High risk exposures for MDRO transmission if known carrier (also high risk for acquisition if non-carrier)

- Presence of wounds (fresh/new, multiple, increased stage/size, active drainage)
- Indwelling devices (IV lines, urinary catheters, tracheostomy, PEG tubes)
- Incontinence
- Current antibiotic use

Consider contact precautions and restricted movement within NH

- Active symptoms of a contagious infection
 - Nausea/vomiting
 - New or worsening diarrhea
 - New or worsening respiratory symptoms
 - New, undiagnosed fever
- Precautions and restrictions time-limited
 - Only until diagnosis made (e.g. infection excluded) and/or symptoms resolve

Discontinuing Contact Precautions

- There is no single 'best' strategy for discontinuation of contact precautions for MDRO carriers (in any setting)
- Typically, would resume standard precautions once high risk exposures or active symptoms have discontinued
- Communication to care-givers and clear documentation of rationale is key

Barrier precautions without isolation

Table 1. Comparison of Preemptive Barrier Precautions for High-Risk vs General Residents of Skilled Nursing Facilities

Enhanced precautions for residents with indwelling devices	Standard precautions for all residents
Place enhanced barrier precautions signs on clinical charts, nursing stations, resident rooms.	None.
Hand hygiene before and after providing any patient care. Hand hygiene performed before donning gloves and after they are removed.	Hand hygiene before and after providing any patient care. Hand hygiene performed before donning gloves and after they are removed.
Gloves to be worn upon entry into rooms of patients with devices. Glove use encouraged when providing any assistance with activities of daily living, such as transfers, grooming, feeding, during physical and occupational therapy and feeding. Gloves must be changed before caring for different patients.	Gloves to be used when contact with blood or potentially infectious materials could occur. Gloves must be changed before caring for different patients.
Protective gown to be worn to protect skin and to prevent soiling or contamination of clothing during procedures and patient care activities when contact with body fluids, blood, secretions, or excretions is expected.	Protective gown to be worn to protect skin and to prevent soiling or contamination of clothing during procedures and patient care activities when contact with body fluids, blood, secretions, or excretions is expected.
Protective gown to be worn when providing any morning and evening care. Morning and evening care activities include dressing (clothing change, including donning or removing shoes, socks, sweaters), bathing (sponge bath daily and showering twice weekly), toileting, oral hygiene (mouth, teeth, and denture care), and grooming (hair care and glasses).	
When residents leave their rooms for any activities, their wounds and other areas of drainage will be covered.	When residents leave their rooms for any activities, their wounds and other areas of drainage will be covered.

Practical Tips

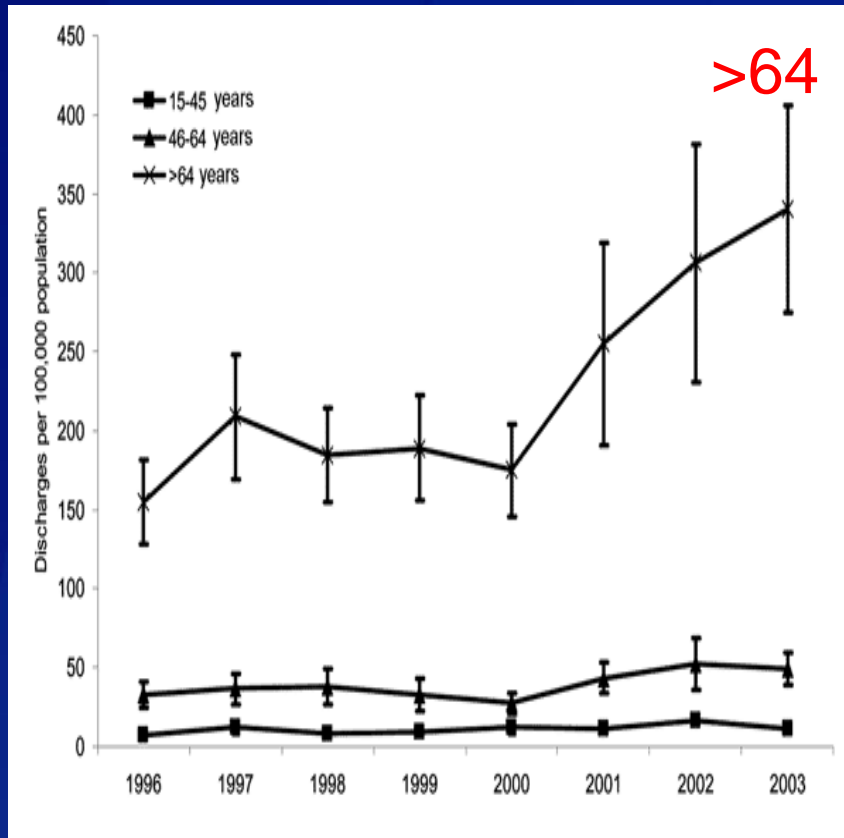
- Maintain an ongoing database of residents with a history of prior MDRO carriage
- Incorporate assessment of risk factors for MDRO carriage or acquisition into resident care planning
- Outline protocols for implementation and discontinuation of contact precautions
- Regularly assess staff knowledge of MDRO transmission and steps for prevention
- Hand hygiene, hand hygiene, hand hygiene...

Clostridium difficile

- Gram positive rod which grows best without oxygen (anaerobic)
- C.diff has a special growth characteristic called "spores"
 - Hard outer shells in which sleeping bacteria can survive in the environment for long periods
- Spores are shed in large numbers during the diarrhea caused by C diff infection (CDI)



C. difficile infections in nursing homes



Annual Estimates

Category	# Cases	Excess costs	Deaths
Hospital-onset	165K	\$1.3 B	9,000
Community-onset, HCF-associated	50K	\$0.3 B	3,000
Nursing home-onset	263K	\$2.2 B	16,500

McDonald LC et al *Emerg Infect Dis* 2006;12

Dubberke et al. *Clin Infect Dis*. 2008;46:497-504

Dubberke et al. *Emerg Infect Dis*. 2008;14:1031-8

Elixhauser et al. HCUP Statistical Brief #50. 2008

Diagnosis, Management, and Prevention of *Clostridium difficile* Infection in Long-Term Care Facilities: A Review

Andrew E. Simor, MD

- More than half of healthcare associated CDI cases occur in long-term care facilities
- A significant number of individuals admitted to LTC are colonized with *C difficile*
 - Up to 20% acquire it while in nursing homes
- CDI is the most commonly identified cause of acute diarrheal illness in the LTC population

Steps to C. diff infection (CDI)

Acquisition of C.
difficile

Antibiotic therapy

Changes normal
colonic bacteria

C diff over grows and
produces toxin



How does C. diff transmission occur in healthcare facilities?

RESERVOIR

- ❑ Colonized individuals
- ❑ Environmental contamination

SPREAD

- ❑ HCP hand contamination
- ❑ Shared equipment contamination

Table I. Microbiologic factors that can facilitate surface environment-mediated transmission of selected pathogens

Pathogen able to survive for prolonged periods of time on environmental surfaces (all)
Ability to remain virulent after environmental exposure (all)
Contamination of the hospital environment frequent (all)
Ability to colonize patients (<i>Acinetobacter</i> , <i>C difficile</i> , MRSA, VRE)
Ability to transiently colonize the hands of health care workers (all)
Transmission via the contaminated hands of healthcare workers (all)
Small inoculating dose (<i>C difficile</i> , norovirus)
Relative resistance to disinfectants used on environmental surfaces (<i>C difficile</i> , norovirus)

C difficile, *Clostridium difficile*; MRSA, methicillin-resistant *Staphylococcus aureus*; VRE, vancomycin-resistant *Enterococcus* spp.

Evaluate use of CDI diagnostics and communication of results

- ❑ What prompts stool testing for CDI in my facility?
- ❑ What test is used by the lab?
- ❑ How quickly are results communicated to providers?
- ❑ Do we have a protocol for implementing appropriate precautions on known or suspected CDI cases?

Managing a resident with C diff.

- The goal of therapy for C diff infection is to stop the symptoms of diarrhea, abdominal upset and fever
- Once the diarrhea has resolved, the resident is safe to move about the facility
- Residents can carry C.diff in their bowels (colonized) for months after their diarrhea resolves
- After being treating a resident for CDI, there is NO VALUE in sending multiple C diff stool studies to see if "the infection has cleared"
 - Often you'll continue to get positive results which prompt unnecessary additional treatment

C diff. prevention challenges

- Spores are not killed by alcohol hand rubs; the act rubbing your hands with soap under water removes the spores
- Spores are resistant to common cleaners and require bleach or a disinfectant with sporucidal activity to be effectively killed



Environmental cleaning

Assess adequacy of cleaning before changing to new cleaning product such as bleach

- ❑ Ensure that environmental cleaning is adequate and high-touch surfaces are not being overlooked
- ❑ One study using a fluorescent environmental marker to assess cleaning showed:
 - Only 47% of high-touch surfaces in 3 hospitals were cleaned
 - Sustained improvement in cleaning of all objects, especially in previously poorly cleaned objects, following educational interventions with the environmental services staff
- ❑ The use of environmental markers is a promising method to improve cleaning.

Steps to C. diff infection (CDI)



Acquisition of C.
difficile

Antibiotic therapy

Changes normal
colonic bacteria

C diff over grows and
produces toxin



Ways antibiotics can be misused

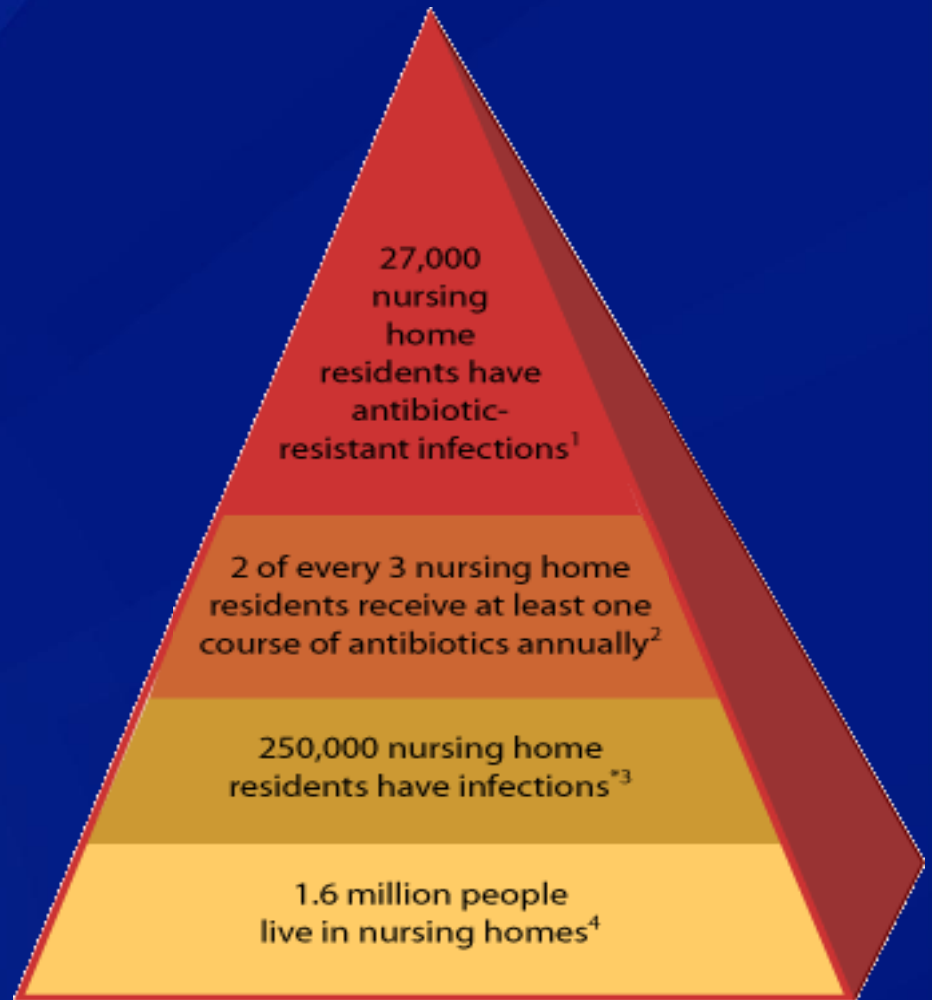
- Given when they are not needed
- Continued when they are no longer necessary
- Given at the wrong dose
- Broad spectrum agents are used to treat very susceptible bacteria
- The wrong antibiotic is given to treat an infection

<http://www.cdc.gov/getsmart/healthcare/inpatient-stewardship.html#Facts>



Antimicrobial use in nursing homes

- ❑ Antimicrobials are the most frequently prescribed drug class
 - Comprise 40% of all prescriptions
 - 50-70% of residents will receive an antimicrobial during the year
- ❑ 25-75% of antimicrobial use may be inappropriate



Antibiotic Stewardship

- Careful antibiotic use is a critical component in the control of MDROs
- Know the frequency/indications for antibiotic use by medical providers in your facility
 - Apply criteria to assess utilization in a standard way
- Develop standard protocols for communicating concerns and assessing residents who are suspected to have an infection between nursing and medical staff
 - Ensure documentation of signs/symptoms is complete

Carbapenemase-resistance

Enterobacteriaceae (CRE)

- Carbapenemases hydrolyze all the beta-lactam antibiotics
 - Including imipenem, meropenem, ertapenem and doripenem
- Metallo- β -lactamases
 - Widely found in *Pseudomonas* and *Acinetobacter* spp.
 - Carried on gene cassettes inserted into mobile integrons
- Class A Carbapenemases
 - KPC is one example, first isolated from *Klebsiella pneumoniae*; now emerging in *Enterobacteriaceae*
 - Plasmid mediated – carries with it resistance genes to fluoroquinolones and aminoglycosides

Distribution of CRE in the US, 2011



Management of CRE

- Asymptomatic colonization of the urinary tract or wounds does not require therapy
 - KPC carriage can spontaneously disappear once antibiotic selection pressure has been removed
- Consider keeping carriers with devices and wounds in contact precautions for direct care even if no evidence of active infection

Careful Device Utilization

- Know the population of residents with indwelling medical devices
 - May require focused infection surveillance
- Continually assess the ongoing need for devices
 - Develop a bladder protocol for urinary catheter removal
 - Resist the temptation to retain IV lines beyond the duration of treatment “just in case”
- Ensure staff are comfortable and trained on handling/maintenance of medical devices

Carbapenem-Resistant *Klebsiella pneumoniae* Associated with a Long-Term-Care Facility — West Virginia, 2009–2011

On January 27, 2011, a West Virginia county health department was notified of a cluster of carbapenem-resistant *Klebsiella pneumoniae* (CRKP) cases detected by a local hospital (hospital A). CRKP infections frequently are resistant to a majority of antimicrobial agents and have an increased risk

- Lack of communication during transitions between acute and long-term care facilities has resulted in outbreaks of Carbapenem-resistant Gram-negative organisms

Carbapenem-Resistant *Escherichia coli* Harboring *Klebsiella pneumoniae* Carbapenemase β -Lactamases Associated with Long-Term Care Facilities

Carl Urban,^{1,2} Patricia A. Bradford,⁴ Margareta Tuckman,⁴ Sorana Segal-Maurer,^{1,3} Wehbeh Wehbeh,^{1,3} Louise Grenner,¹ Rita Colon-Urban,⁵ Noriel Mariano,¹ and James J. Rahal^{1,3}

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Nine carbapenem-resistant *Escherichia coli* isolates harboring *Klebsiella pneumoniae* carbapenemase (KPC)–2 or KPC–3 enzymes were identified in patients residing in 7 distinct long-term care facilities. Cefotaxime-hydrolyzing (CTX-M)–type β -lactamases were also documented in 3 isolates. The identification of these enzymes in patients staying in long-term care facilities should be of great concern to all components of health care systems.

Inter-facility Communication

- Mechanism for communicating MDRO carriage and other risk factors at time of transfer between facilities
- Critical components:
 - MDRO history of current infection or carriage
 - Device utilization
 - Current antibiotic treatments (indication/duration)
 - Bedside care issues (wounds, continence, etc)

Original concept and form developed by Utah HAI Working Group/ Courtesy of Utah State Dept of Health.

Inter-facility Infection Control Transfer Form

This form must be filled out for transfer to accepting facility with information communicated prior to or with transfer

Please attach copies of latest culture reports with susceptibilities if available

Sending Healthcare Facility:

Patient/Resident Last Name	First Name	Date of Birth	Medical Record Number
		___/___/___	

Name/Address of Sending Facility	Sending Unit	Sending Facility phone

Sending Facility Contacts	NAME	PHONE	E-mail
Case Manager/Admin/SW			
Infection Prevention			

Is the patient currently in isolation? ☐ NO ☐ YES

Type of Isolation (check all that apply) ☐ Contact ☐ Droplet ☐ Airborne ☐ Other: _____

Does patient currently have an infection, colonization OR a history of positive culture of a multidrug-resistant organism (MDRO) or other organism of epidemiological significance?	Colonization or history Check if YES	Active infection on Treatment Check if YES
Methicillin-resistant <i>Staphylococcus aureus</i> (MRSA)		
Vancomycin-resistant <i>Enterococcus</i> (VRE)		
<i>Clostridium difficile</i>		
<i>Acinetobacter</i> , multidrug-resistant*		
<i>E coli</i> , <i>Klebsiella</i> , <i>Proteus</i> etc. w/Extended Spectrum B-Lactamase (ESBL)*		
Carbapenemase resistant <i>Enterobacteriaceae</i> (CRE)*		
Other:		

Does the patient/resident currently have any of the following?

- | | |
|---|--|
| <input type="checkbox"/> Cough or requires suctioning
<input type="checkbox"/> Diarrhea
<input type="checkbox"/> Vomiting
<input type="checkbox"/> Incontinent of urine or stool
<input type="checkbox"/> Open wounds or wounds requiring dressing change
<input type="checkbox"/> Drainage (source) _____ | <input type="checkbox"/> Central line/PICC (Approx. date inserted ___/___/___)
<input type="checkbox"/> Hemodialysis catheter
<input type="checkbox"/> Urinary catheter (Approx. date inserted ___/___/___)
<input type="checkbox"/> Suprapubic catheter
<input type="checkbox"/> Percutaneous gastrostomy tube
<input type="checkbox"/> Tracheostomy |
|---|--|

Is the patient/resident currently on antibiotics? ☐ NO ☐ YES:

Antibiotic and dose	Treatment for:	Start date	Anticipated stop date

http://www.cdc.gov/HAI/prevent/prevention_tools.html

Take Home Points

- ❑ MDROs move with patients between healthcare settings
 - ❑ Both acute care and LTC settings contribute to emergence/spread
- ❑ Understanding how MDROs emerge and spread in our facilities can focus infection prevention at the bedside and during care transitions
 - ❑ Select 1-2 infection prevention goals for your facility every year
- ❑ Communication across care settings is critical to addressing the problem of MDRO prevention in your community

Thank you!!

**Email: nstone@cdc.gov with
questions/comments**



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The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

**National Center for Emerging and Zoonotic Infectious Diseases
Division of Healthcare Quality Promotion**

